JAPAN

EDICT OF GOVERNMENT

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JIS Z 4601 (2009) (English): Radioactive dust samplers

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The citizens of a nation must honor the laws of the land.

Fukuzawa Yukichi

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JIS

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INDUSTRIAL
STANDARD

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Radioactive dust samplers

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In the event of any doubts arising as to the contents,
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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Electric Measuring Instruments Manufacture's Association (JEMIMA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS Z 4601** : 1997 is replaced with this Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Radioactive dust samplers

Introduction

This Japanese Industrial Standard was established in November 1958 and has gone through five revisions to this day. The last revision was made in July 1997, and it has been revised to correspond to the diversification and the quality improvement of the usage situations.

No corresponding International Standard has been established at this point.

1 Scope

This Standard specifies the radioactive dust samplers (hereafter referred to as "samplers") which can collect radioactive particles by means of filtrating in the air, which is used to obtain the radioactive concentration in air due to the particulate substances for the purpose of radiation protection in working circumstances, exhaust systems, environment, etc. of nuclear facilities, radiation utilizing facilities.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS K 0901 *Form, size and performance testing methods of filtration media for collecting airborne particulate matters*

JIS Z 4001 *Glossary of terms used in nuclear energy*

JIS Z 4336 *Radioactive iodine samplers*

JIS Z 8103 *Glossary of terms used in measurement*

3 Terms and definitions

For the purposes of this Standard, the terms and definitions given in JIS Z 4001 and JIS Z 8103, and the following shall apply.

3.1 air sampler

an apparatus to suck air by pump or blower

3.2 filter paper holder

a collection part to which the filter paper for collection (hereafter referred to as "filter paper") is attached

4 Classification

4.1 Classification by constitution

The classification by constitution of samplers shall be as follows.

a) **Pump type** a type using a pump in air sampler

b) **Blower type** a type using a blower in air sampler

4.2 Classification by using form

The classification by using form of sampler shall be as follows.

a) **Installation type** a type fixed at necessary place

b) **Transportable type** a type capable of moving by caster, etc.

c) **Portable type** a type used by carrying on shoulder or by hand

5 Performance

5.1 Rated suction flow rate

The rated suction flow rate, when tested according to **7.2.2**, shall be within the range between the nominal value indicated by the manufacturer and that plus 30 %.

5.2 Indication error of flow meter

The indication error of flow meter, when tested according to **7.2.3**, shall be within the range of ± 10 % to the maximum scale value. However, if the flow meter is verified or calibrated independently and satisfies the performance under the condition of being built in sampler, it may be omitted in accordance with the agreement between the parties concerned with delivery.

5.3 Airtightness

The airtightness, when tested according to **7.2.4**, shall be not more than 5 % of the rated suction flow rate. However, for the sampler of which the test can not be structurally carried out, it may be omitted in accordance with the agreement between the parties concerned with delivery.

5.4 Stability to fluctuation of power supply voltage

The stability to the fluctuation of power supply voltage, when tested according to **7.2.5**, shall comply with the provisions in table 1 for the rated suction flow rate.

Table 1 Tolerances on stability to fluctuation of power supply voltage

Classification	Tolerances
Pump type	± 20 %
Blower type	± 30 %

6 Structure

6.1 Structure in general

The structure shall be as follows.

a) The sampler shall consist of an air sampler, a filter paper holder and a flow meter. For the portable type, a flow meter may be omitted.

b) The structure shall be so that the decontamination or replacement of parts can be

easily carried out.

c) The structure shall be so that the particulate substances can be uniformly collected on the filter paper.

d) The structure shall be so that suspended particulate substances are not precipitated in other flow route than the filter paper.

e) As occasion demands, a pressure gauge may be equipped.

6.2 Air sampler

The air sampler shall be as follows.

a) The structure shall be so as to resist the pressure change generated under the ordinary operational condition.

b) The place where a person may easily touch in course of using shall be made to be the temperature without hazardous.

c) There should be no noticeable vibration and no noise in course of using.

d) When the flow rate adjusting valve is equipped, the structure shall be so that the flow rate is adjustable and does not easily vary.

6.3 Filter paper holder

The filter paper holder shall be as follows.

a) The structure shall be so that the bypath leak between the filter paper holder and filter paper is negligible.

b) The structure shall be so that the attaching and detaching of filter paper can be easily carried out.

c) A support may be attached to the back of filter paper to avoid the deformation of filter paper.

d) The structure may be so as to be that used by combining the filter material for collection of iodine as specified in JIS Z 4336.

7 Tests

7.1 Common test conditions

The reference conditions in test method of 7.2 shall be in accordance with the second column of table 2. Unless especially specified, the tests in this Standard shall be carried out under the standard test conditions specified in the third column of table 2. When the test cannot be carried out under the standard test conditions, the temperature and atmospheric pressure shall be corrected as appropriate and those shall be made to be the indicated value under the reference conditions.

Table 2 Common test conditions

Item		Reference condition	Standard test condition
Environment temperature	°C	20	18 to 22
Relative humidity	%	65	55 to 75
Atmospheric pressure	kPa	101.3	86 to 106
Power supply voltage	V	Rated power supply voltage	Rated power supply voltage ± 1 %
Power supply frequency	Hz	Rated power supply frequency	Rated power supply frequency ± 2 %

7.2 Test methods

7.2.1 General

In the case where the test is carried out by changing the condition of one item among the test conditions, conditions other than that item shall be in the range of the standard test conditions specified in table 2. The test shall be carried out by attaching a sheet of unused filter paper similarly to the using state. However, in the tests of 7.2.2, 7.2.3 and 7.2.5, the resistance plate whose pressure loss is equivalent to the filter paper may be used. The filter paper used for test shall be the one specified in JIS K 0901, and the collection efficiency shall be not less than 95 % to the particle of 0.3 μm in particle size. In the case of the sampler not equipped with a flow meter, a reference flow meter shall be connected to the flow route of sampler and the indicated value shall be recorded.

7.2.2 Rated suction flow rate test

The indicated value of flow meter at the rated voltage value shall be read out. For the sampler capable of adjusting flow rate, the indicated value of flow meter at the maximum flow rate shall be read out.

7.2.3 Indication error test of flow metre

This test shall be carried out on the sampler equipped with a flow meter. The reference flow meter shall be inserted to the flow route in series and the indication error shall be obtained by changing the flow rate. The test shall be carried out at three points near 30 %, 60 % and 90 % of the flow rate in the range of the suction flow rate of the sampler. The percentage of the indication value of flow meter from which the indication value of the reference flow meter is subtracted to the maximum scale value of the flow meter shall be obtained. However, when the test at three points mentioned above cannot be carried out, for example, due to the limited range of variable flow rate of sampler, the points may be made to two or one in accordance with the agreement between the parties concerned with delivery.

7.2.4 Airtightness test

First, the suction mouth of sampler shall be closed with a closing plate, etc., so that the difference between the pressure in the flow route and atmospheric pressure becomes 13 kPa or more by reducing the pressure. Then, the inlet of pump shall be closed and the pump shall be stopped. This time shall be made zero, and the indication value after lapse of five min shall be read. The amount of leakage (Q) shall be obtained by

the following formula and the percentage of the leakage to the rated suction flow rate shall be obtained.

In the case of a sampler not equipped with a pressure gauge, a pressure gauge shall be connected at an adequate position such as a suction mouth, and the test shall be carried out. In such a case, care shall be taken so as not to leak from the connection part.

$$Q = -\frac{VP_0}{101.3} \times \left\{ \frac{1}{5} \ln\left(\frac{P_5}{P_0} \right) \right\}$$

where, Q: Amount of leakage (L/min)

V: Volume of closed flow route (L)

P_0: Difference between pressure in flow route at zero in time and atmospheric pressure (kPa)

P_5: Difference between pressure in flow route after five min and atmospheric pressure (kPa)

7.2.5 Stability test for fluctuation of power supply voltage

The indicated value of flow metre shall be read out for the cases where the power supply voltage is made to be 88 % and 110 % of the rated voltage value. The value obtained in 7.2.2 is taken as the reference value, and the percentage of the indication value at each voltage from which the reference value is subtracted to the reference value shall be obtained.

8 Inspections

8.1 General

The inspections of sampler shall be divided into the type inspection [1)] and the delivery inspection [2)], and the inspection items shall be as follows, respectively.

The principle of random inspections for type inspection and delivery inspection shall be in accordance with the agreement between the parties concerned with delivery.

Notes [1)] The inspection to judge whether the quality of product satisfies all of the characteristics indicated in design or not.

[2)] The inspection, when the product designed and manufactured as same as the product which has already passed the type inspection is delivered, to judge whether it satisfies the characteristics recognized to be necessary or not.

8.2 Type inspection

The type inspection shall be carried out on the following items in accordance with clause 7, and the sampler which complies with the provisions given in clause 5 shall be accepted.

a) Rated suction flow rate

b) Indication error of flow metre

c) Airtightness

d) Stability to fluctuation of power supply voltage

8.3 Delivery inspection

The delivery inspection shall be carried out on the following items in accordance with the agreement between the parties concerned with delivery in addition to the following items, and the sampler which complies with the provisions given in clause 5 shall be accepted.

a) Rated suction flow rate

b) Indication error of flow meter

c) Airtightness

9 Marking

The following items shall be indelibly marked on the conspicuous position of each sampler.

a) Title of this Standard and number of this Standard

b) Classification

c) Manufacturing number

d) Rated voltage

e) Rated frequency

f) Manufacturer's name or its abbreviation

g) Date of manufacture

10 Instruction manual

The instruction manual including at least following information shall be attached to the sampler.

a) Classification

b) Type of filtering paper to be used

c) Rated suction flow rate

d) Suction flow rate range (for a sampler equipped with flow rate adjusting valve)

e) Pressure gauge display range (for a sampler equipped with pressure gauge)

f) Correction curve of indicating value of flow meter, if the correction of indication value due to pressure fluctuation is necessary (for a sampler equipped with a flow meter and pressure gauge)

g) Precautions for operation

h) Other necessary items

Errata for JIS (English edition) are printed in *Standardization and Quality Control*, published monthly by the Japanese Standards Association, and also provided to subscribers of JIS (English edition) in *Monthly Information*.

Errata will be provided upon request, please contact:

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